

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,977,235 B2
APPLICATION NO. : 10/829550
DATED : December 20, 2005
INVENTOR(S) : Max P. McDaniel et al.

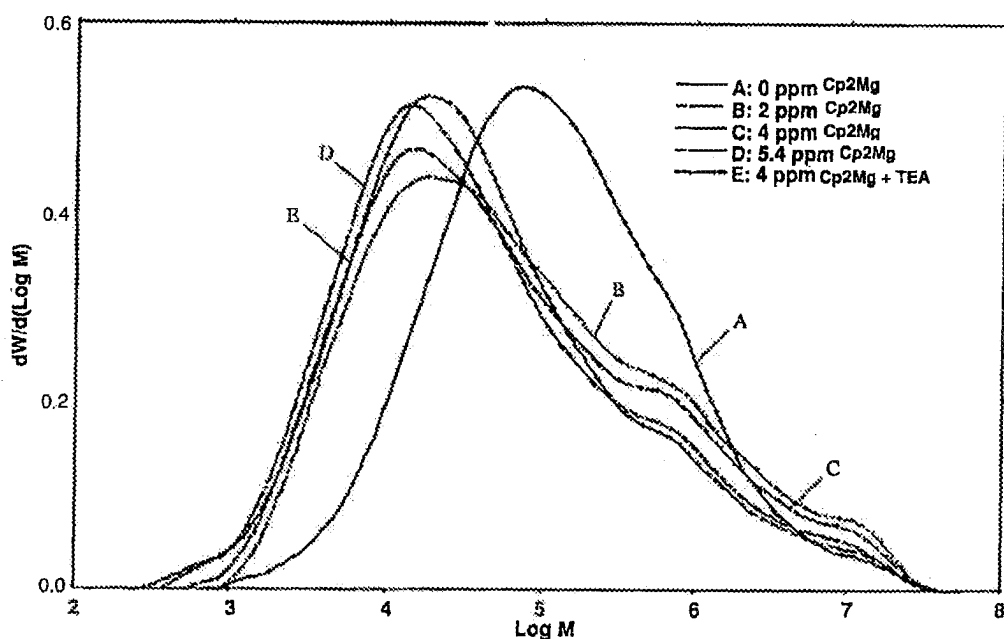
Page 1 of 2

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page, showing an illustrative figure, should be deleted and substitute therefor the attached title page.

Drawings - Sheet 2 of 3

Replace Figure 2 with the following figure:



In Column 1, line 55, replace “(i.e., M_w/m_N)” with -- (i.e., M_w/M_N) --

In Column 7, line 57, replace “the Theological breadth” with -- the rheological breadth --

In Column 8, line 21, replace “have Theological breadth” with -- have rheological breadth --

Signed and Sealed this
Twenty-second Day of March, 2011

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

(12) **United States Patent**
McDaniel et al.(10) **Patent No.: US 6,977,235 B2**
(45) **Date of Patent: Dec. 20, 2005**(54) **CATALYST SYSTEMS COMPRISING A
CALCINED CHROMIUM CATALYST AND A
NON-TRANSITION METAL
CYCLOPENTADIENYL COCATALYST**(75) **Inventors:** Max P. McDaniel, Bartlesville, OK
(US); Elizabeth A. Benham, Spring,
TX (US); Steven J. Secora,
Bartlesville, OK (US); Michael D.
Jensen, Bartlesville, OK (US); Kathy
S. Collins, Bartlesville, OK (US)(73) **Assignee:** Chevron Phillips Chemical Company,
LP, The Woodlands, TX (US)(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.(21) **Appl. No.:** 10/829,550(22) **Filed:** Apr. 22, 2004(65) **Prior Publication Data**

US 2005/0239638 A1 Oct. 27, 2005

(51) **Int. Cl.⁷** B01J 31/00; B01J 37/00;
C08F 37/00; C08F 4/02(52) **U.S. Cl.** 502/117; 502/102; 502/103;
502/104; 502/150(58) **Field of Search** 502/117, 102, 103,
502/104, 150(56) **References Cited****U.S. PATENT DOCUMENTS**

2,825,721 A	3/1958	Hogan et al.	260/88.1
3,119,569 A	1/1964	Baricordi	241/55
3,152,157 A *	10/1964	Shapiro et al.	556/58
3,248,179 A	4/1966	Norwood	23/285
3,622,521 A	11/1971	Hogan et al.	252/430
3,625,864 A	12/1971	Horvath	252/430
3,887,494 A	6/1975	Dietz	252/452
3,900,457 A	8/1975	Witt	260/94.9
3,947,433 A	3/1976	Witt	260/88.2 R

4,015,059 A	3/1977	Karol	526/130
4,053,436 A	10/1977	Hogan et al.	252/452
4,081,407 A	3/1978	Short et al.	252/458
4,151,122 A	4/1979	McDaniel et al.	252/458
4,152,503 A	5/1979	Short et al.	526/106
4,177,162 A	12/1979	McDaniel et al.	252/439
4,182,815 A	1/1980	McDaniel et al.	526/96
4,247,421 A	1/1981	McDaniel et al.	252/458
4,248,735 A	2/1981	McDaniel et al.	252/428
4,277,587 A	7/1981	McDaniel et al.	526/106
4,294,724 A	10/1981	McDaniel	252/451

(Continued)

FOREIGN PATENT DOCUMENTS

JP 50045078 A2 4/1975

OTHER PUBLICATIONSDocket, "Cp Cocatalysts for Chromium Catalysts,"
PI-210481 Search Report, Jul. 24, 2003, 35 pgs.

(Continued)

Primary Examiner—J. A. Lorengo*Assistant Examiner*—Jennine Brown(74) *Attorney, Agent, or Firm*—Conley Rose, P.C.; Rodney
B. Carroll; Cheryl L. Huseman(57) **ABSTRACT**

According to an embodiment, catalyst systems for polymerizing olefins include a catalyst comprising chromium and a cocatalyst comprising a substituted or unsubstituted non-transition metal cyclopentadienyl compound (Cp). The catalyst also comprises an inorganic oxide support. In an embodiment, methods of preparing a catalyst comprise contacting a support with chromium and with a non-transition metal Cp compound. In one embodiment, the support may be contacted with a solution comprising the non-transition metal Cp compound prior to entry into a reaction zone. In another embodiment, the activated catalyst and non-transition metal Cp compound may be added separately to the reaction zone.

23 Claims, 3 Drawing Sheets